

(12) INTERNATIONAL PUBLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
17 June 2004 (17.06.2004)

PCT

(10) International Publication Number
WO 2004/051579 A3

(51) International Patent Classification: A61B 8/00,
G06T 17/00

(21) International Application Number:
PCT/IB2003/005442

(22) International Filing Date:
27 November 2003 (27.11.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
02102682.8 4 December 2002 (04.12.2002) EP

(71) Applicant (for DE only): PHILIPS INTELLECTUAL
PROPERTY & STANDARDS GMBH [DE/DE]; Stein-
damm 94, 20099 Hamburg (DE).

(71) Applicant (for AE, AG, AL, AM, AT, AU, AZ, BA, BB, BE,
BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CY, CZ,
DK, DM, DZ, EC, EE, EG, ES, FI, FR, GB, GD, GE, GH,
GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC,
LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX,

MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD,
SE, SG, SK, SL, SY, SZ, TJ, TM, TN, TR, TT, TZ, UA, UG,
UZ, VC, VN, YU, ZA, ZM, ZW only): KONINKLIJKE
PHILIPS ELECTRONICS N.V. [NL/NL]; Groenewoud-
seweg 1, NL-5621 BA Eindhoven (NL).

(72) Inventor; and

(75) Inventor/Applicant (for US only): WEESE, Juergen
[DE/DE]; c/o Philips Intellectual Property & Standards
GmbH, Weissshausstr. 2, 52066 Aachen (DE).

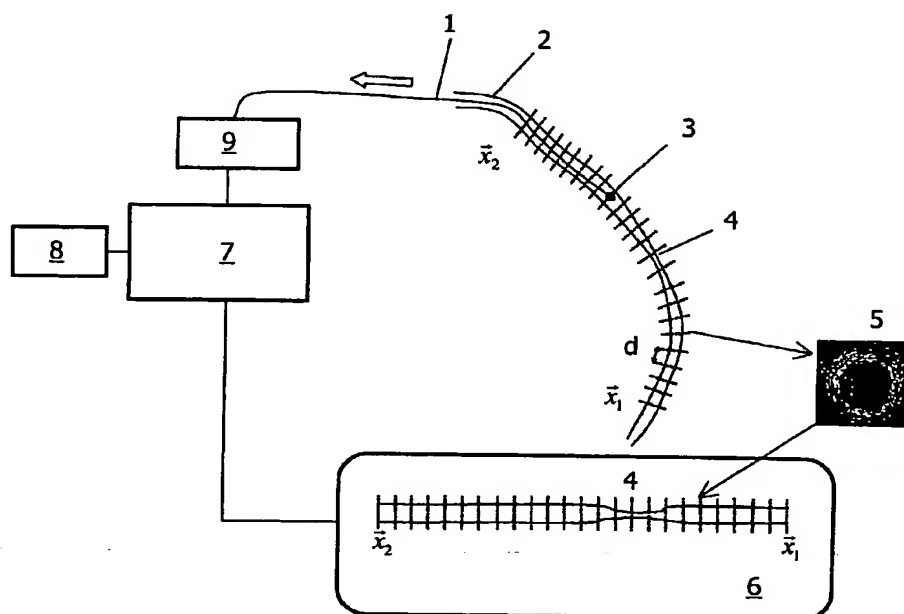
(74) Agent: VOLMER, Georg; Philips Intellectual Property &
Standards GmbH, Weissshausstr. 2, 52066 Aachen (DE).

(81) Designated States (national): AE, AG, AL, AM, AT, AU,
AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR,
CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD,
GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR,
KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN,
MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU,
SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA,
UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (regional): ARIPO patent (BW, GH,
GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),
Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),

[Continued on next page]

(54) Title: APPARATUS AND METHOD FOR ASSISTING THE NAVIGATION OF A CATHETER IN A VESSEL



(57) Abstract: The invention relates to the assistance of the navigation of a catheter (1) in a vessel (2). A sequence of cross-sectional images of the portion of the vessel that is of interest is first obtained with the help of an intravascular ultrasound (IVUS) probe (3) and stored as a roadmap of the vessel. A cross-sectional image (10) that is obtained at the current position of the IVUS probe (3) can then be sorted to the position on the roadmap that is the best fit. A model (3') of the probe, and a model (11') of the instrument (a stent (11), for example) coupled to the probe, can be shown on a display (6) at the corresponding position on the roadmap.



European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(88) Date of publication of the international search report:
5 August 2004

Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

P B 03/05442

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A61B8/00 G06T17/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G06T A61B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| X | US 2002/077546 A1 (BECKMANN FRIEDRICH-KARL ET AL) 20 June 2002 (2002-06-20) abstract paragraphs '0002!, '0009!, '0014! paragraphs '0016!, '0023!, '0026! paragraphs '0028!, '0029!, '0037! figure 1 | 1-10 |
| X | EP 0 885 594 A (MEDINOL LTD) 23 December 1998 (1998-12-23) abstract figures 2A,4 page 2, line 15 - line 25 page 2, line 51 - line 55 page 6, line 2 - line 8 page 19, line 23 - page 20, line 10 figure 15 ----- -/-- | 1-10 |

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
"&" document member of the same patent family

Date of the actual completion of the international search

9 June 2004

Date of mailing of the international search report

16/06/2004

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Vollmann, K

INTERNATIONAL SEARCH REPORT

PCT/IB 03/05442

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category ° | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| A | ROBB R A: "Visualization in biomedical computing" PARALLEL COMPUTING, ELSEVIER PUBLISHERS, AMSTERDAM, NL, vol. 25, no. 13-14, December 1999 (1999-12), pages 2067-2110, XP004363672 ISSN: 0167-8191 abstract page 2097, last paragraph - page 2098 figures 30-34 | 1-10 |
| A | US 6 083 167 A (CROCKER IAN R ET AL) 4 July 2000 (2000-07-04) the whole document | 1-10 |

INTERNATIONAL SEARCH REPORT

P03/05442

| Patent document cited in search report | | Publication date | Patent family member(s) | Publication date |
|-------------------------------------------|----|---------------------|----------------------------|---------------------|
| US 2002077546 | A1 | 20-06-2002 | DE 10051244 A1 | 16-05-2002 |
| | | | EP 1199031 A2 | 24-04-2002 |
| | | | JP 2002200058 A | 16-07-2002 |
| EP 0885594 | A | 23-12-1998 | US 5924990 A | 20-07-1999 |
| | | | AT 236574 T | 15-04-2003 |
| | | | AU 757314 B2 | 13-02-2003 |
| | | | AU 7307498 A | 14-01-1999 |
| | | | AU 8032298 A | 04-01-1999 |
| | | | BR 9814778 A | 26-06-2001 |
| | | | CA 2240651 A1 | 19-12-1998 |
| | | | CZ 9801901 A3 | 13-10-1999 |
| | | | DE 19827460 A1 | 24-12-1998 |
| | | | DE 69813087 D1 | 15-05-2003 |
| | | | DE 69813087 T2 | 05-02-2004 |
| | | | DK 885594 T3 | 14-07-2003 |
| | | | EE 9800196 A | 15-02-1999 |
| | | | EP 1227342 A1 | 31-07-2002 |
| | | | EP 0885594 A2 | 23-12-1998 |
| | | | ES 2192290 T3 | 01-10-2003 |
| | | | GB 2326479 A ,B | 23-12-1998 |
| | | | WO 9857580 A1 | 23-12-1998 |
| | | | JP 11151246 A | 08-06-1999 |
| | | | NO 982817 A | 21-12-1998 |
| | | | PL 326831 A1 | 21-12-1998 |
| | | | PT 885594 T | 29-08-2003 |
| | | | SG 68672 A1 | 16-11-1999 |
| | | | SK 87098 A3 | 14-02-2000 |
| | | | US 6152878 A | 28-11-2000 |
| | | | US 6095976 A | 01-08-2000 |
| US 6083167 | A | 04-07-2000 | AU 747079 B2 | 09-05-2002 |
| | | | AU 2579399 A | 23-08-1999 |
| | | | CA 2319580 A1 | 12-08-1999 |
| | | | EP 1054616 A1 | 29-11-2000 |
| | | | WO 9939628 A1 | 12-08-1999 |
| | | | US 6273858 B1 | 14-08-2001 |

INTERNATIONAL SEARCH REPORT

PC 03/05442

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A61B8/00 G06T17/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G06T A61B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| X | US 2002/077546 A1 (BECKMANN FRIEDRICH-KARL ET AL) 20 June 2002 (2002-06-20) abstract paragraphs '0002!, '0009!, '0014! paragraphs '0016!, '0023!, '0026! paragraphs '0028!, '0029!, '0037! figure 1 | 1-10 |
| X | EP 0 885 594 A (MEDINOL LTD) 23 December 1998 (1998-12-23) abstract figures 2A,4 page 2, line 15 - line 25 page 2, line 51 - line 55 page 6, line 2 - line 8 page 19, line 23 - page 20, line 10 figure 15 ----- -/-- | 1-10 |

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the International search

9 June 2004

Date of mailing of the International search report

16/06/2004

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Vollmann, K

INTERNATIONAL SEARCH REPORT

P 03/05442

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| A | <p>ROBB R A: "Visualization in biomedical computing" PARALLEL COMPUTING, ELSEVIER PUBLISHERS, AMSTERDAM, NL, vol. 25, no. 13-14, December 1999 (1999-12), pages 2067-2110, XP004363672 ISSN: 0167-8191 abstract page 2097, last paragraph - page 2098 figures 30-34</p> | 1-10 |
| A | <p>US 6 083 167 A (CROCKER IAN R ET AL) 4 July 2000 (2000-07-04) the whole document</p> | 1-10 |

INTERNATIONAL SEARCH REPORT

PCT/JP 03/05442

| Patent document cited in search report | | Publication date | | Patent family member(s) | Publication date |
|-------------------------------------------|----|---------------------|----|----------------------------|---------------------|
| US 2002077546 | A1 | 20-06-2002 | DE | 10051244 A1 | 16-05-2002 |
| | | | EP | 1199031 A2 | 24-04-2002 |
| | | | JP | 2002200058 A | 16-07-2002 |
| EP 0885594 | A | 23-12-1998 | US | 5924990 A | 20-07-1999 |
| | | | AT | 236574 T | 15-04-2003 |
| | | | AU | 757314 B2 | 13-02-2003 |
| | | | AU | 7307498 A | 14-01-1999 |
| | | | AU | 8032298 A | 04-01-1999 |
| | | | BR | 9814778 A | 26-06-2001 |
| | | | CA | 2240651 A1 | 19-12-1998 |
| | | | CZ | 9801901 A3 | 13-10-1999 |
| | | | DE | 19827460 A1 | 24-12-1998 |
| | | | DE | 69813087 D1 | 15-05-2003 |
| | | | DE | 69813087 T2 | 05-02-2004 |
| | | | DK | 885594 T3 | 14-07-2003 |
| | | | EE | 9800196 A | 15-02-1999 |
| | | | EP | 1227342 A1 | 31-07-2002 |
| | | | EP | 0885594 A2 | 23-12-1998 |
| | | | ES | 2192290 T3 | 01-10-2003 |
| | | | GB | 2326479 A , B | 23-12-1998 |
| | | | WO | 9857580 A1 | 23-12-1998 |
| | | | JP | 11151246 A | 08-06-1999 |
| | | | NO | 982817 A | 21-12-1998 |
| | | | PL | 326831 A1 | 21-12-1998 |
| | | | PT | 885594 T | 29-08-2003 |
| | | | SG | 68672 A1 | 16-11-1999 |
| | | | SK | 87098 A3 | 14-02-2000 |
| | | | US | 6152878 A | 28-11-2000 |
| | | | US | 6095976 A | 01-08-2000 |
| US 6083167 | A | 04-07-2000 | AU | 747079 B2 | 09-05-2002 |
| | | | AU | 2579399 A | 23-08-1999 |
| | | | CA | 2319580 A1 | 12-08-1999 |
| | | | EP | 1054616 A1 | 29-11-2000 |
| | | | WO | 9939628 A1 | 12-08-1999 |
| | | | US | 6273858 B1 | 14-08-2001 |